The Gravitational Breath

Equation Derivation and Audit■Grade Test Procedure (v2 – Upgraded)

1. Model Scope and Discipline

This document presents a phenomenological, bounded model describing a hypothesized low■frequency modulation of effective weight due to large■scale planetary dynamics. It does not introduce a new force, does not modify General Relativity, and does not assert a microscopic mechanism. All claims are correlational and falsifiable.

2. Observable Definition

Let m be a test mass, g■ the locally corrected Newtonian gravitational acceleration, and W■ = m g■ the expected static weight. We define the local weight variance ΔW_{loc} as the deviation from W■ measured over time.

3. Phenomenological Derivation

A bounded oscillatory modulation is introduced to represent a candidate global normal mode of the Earth system. The modulation is constrained to conserve energy over a full cycle and to vanish under time averaging.

$$\Delta W_{loc}(t, \lambda) = m\, g■ \cdot A(\lambda) \cdot \sin(\omega\oplus\, t + \phi_{lat}(\lambda)) \cdot B■_{ext}(t)$$

Where $A(\lambda)$ ■ 1 is a dimensionless amplitude coefficient, $\omega\oplus$ is a phenomenological angular frequency ($\approx 2\pi \times 0.0117$ Hz), ϕ_{lat} is a latitude■dependent phase offset, and $B■_{ext}$ is an optional dimensionless external anisotropy modifier. The time■averaged value of ΔW_{loc} is identically zero.

4. Expected Signal Magnitude (Operational)

For feasibility assessment, the target signal is expressed in gravimetric units. The hypothesized modulation corresponds to variations on the order of 0.1–10 μGal (10■■–10■■ g), within the detection range of modern superconducting or atom■interferometric gravimeters. This range is a sensitivity target, not a prediction.

5. Measurement Modalities

Primary instrumentation is a precision gravimeter measuring acceleration directly. Ultra■precision micro■balances may be used as a secondary modality, with explicit conversion between apparent mass change and effective acceleration noted. Gravimeters are considered the gold■standard reference.

6. Test Procedure (Pre■Registered)

Continuous measurements are recorded for a minimum of 72 hours under temperature■stabilized conditions. All known corrections (solid Earth tides, ocean loading, atmospheric pressure, polar motion) are applied prior to spectral analysis.

7. Frequency■Domain Analysis

Analysis is pre■registered to search for excess spectral power in the narrow band 0.010–0.014 Hz. Power spectral density is computed using standard periodogram or Welch methods. A detection requires statistical significance above noise models after correction removal.

8. Latitude Phase Correlation

Simultaneous measurements at distinct latitudes are compared. Phase is extracted via sinusoidal fitting or Hilbert transform at $\omega_{\oplus}$. A consistent, non■zero phase offset within predefined uncertainty bounds constitutes evidence for a global mode.

9. Known Confounds Checklist

- Building HVAC or thermal controller cycles
- Vacuum pump or cryogenic system periodicities
- Traffic■induced seismic microseisms
- Power■grid or instrumentation clock harmonics

10. Falsification Criteria

Absence of a statistically significant signal in the pre■registered band after corrections constitutes a null result and falsifies the model in its present form. No ad■hoc parameter adjustment is permitted.

11. Archival Status

This document is suitable for Zenodo or Archive.org submission as an audit■grade phenomenological hypothesis with explicit falsification pathways.